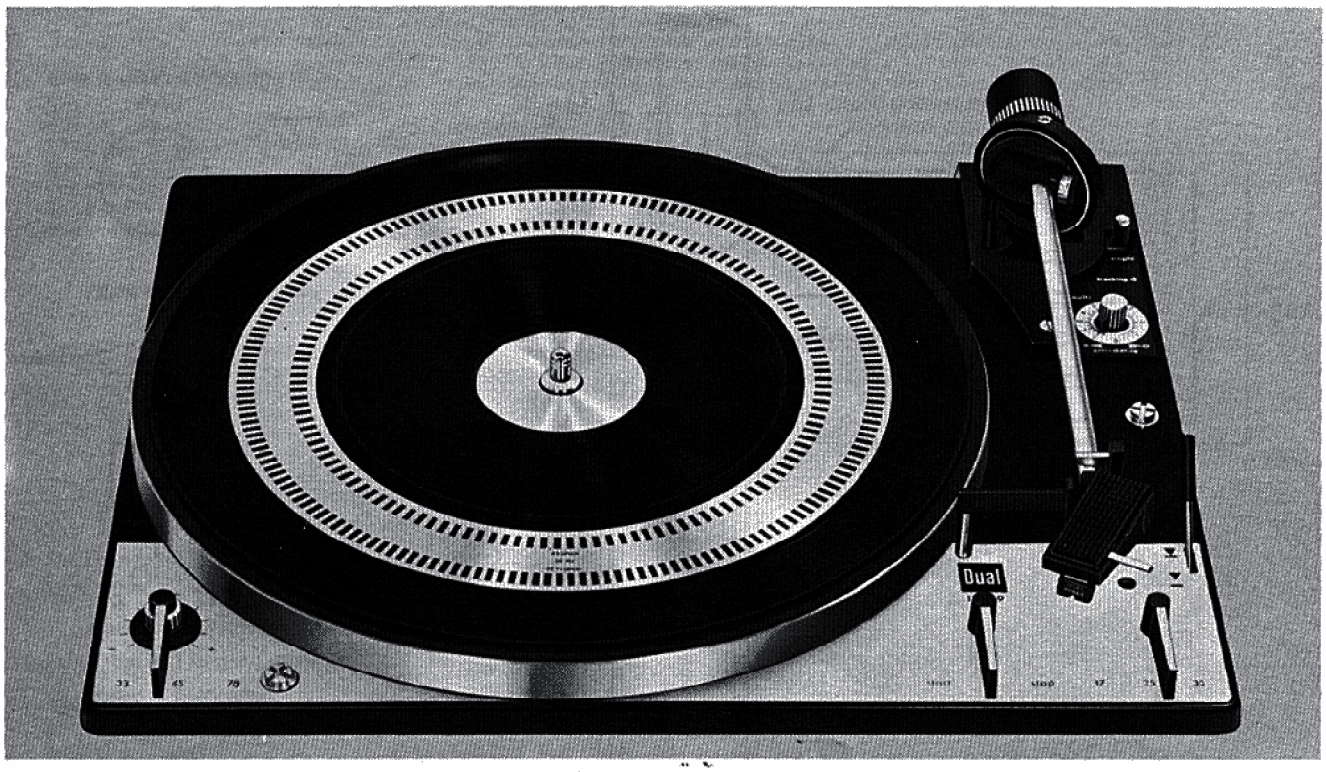
Dual

Service-Manual Dual 1219



Edition July 1970

HiFi-Automatic Turntable Dual 1219

Technical specifications
Function
Trouble chart
Exploded view
Replacement parts list
Lubricating instructions

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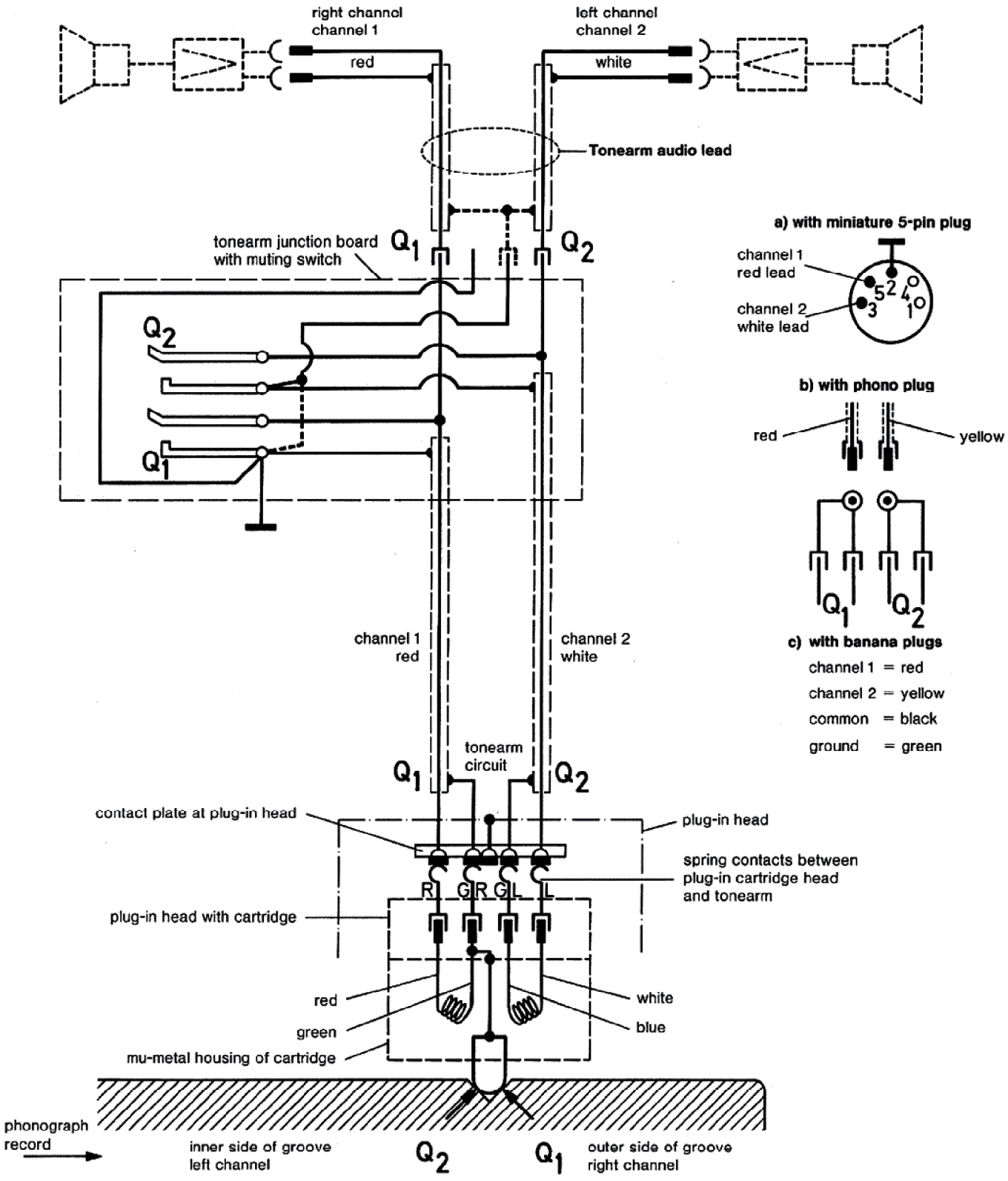
Fig. 1 Tonearm hook-up schematic



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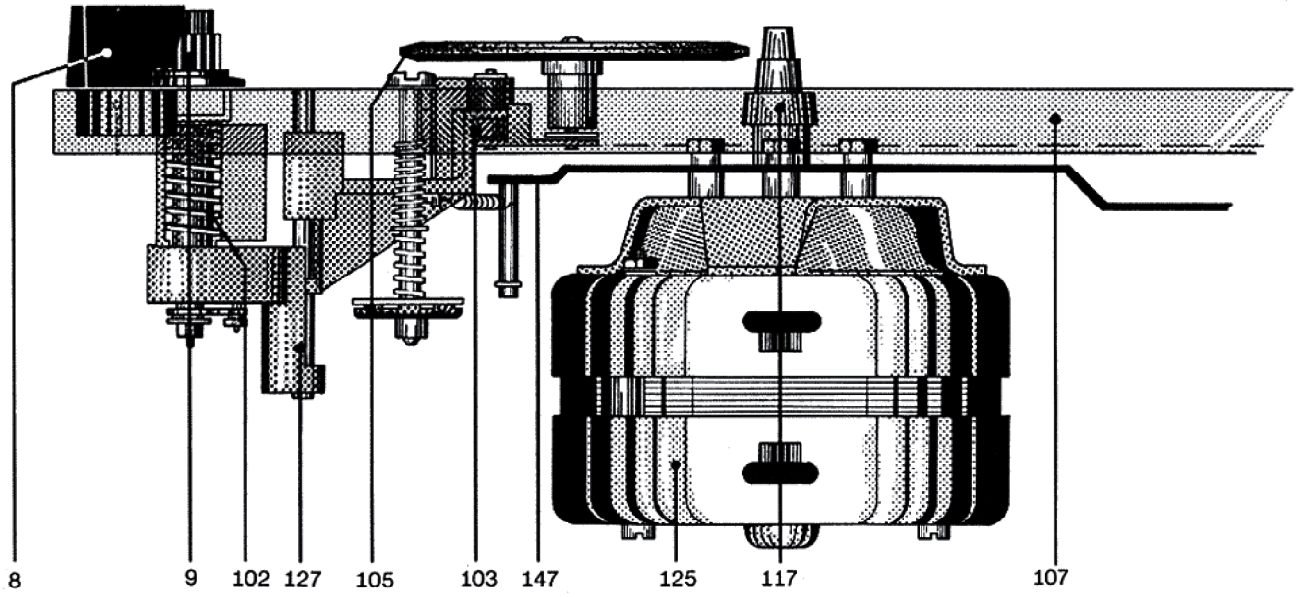
Technical specifications

Power source:	alternating current, 50 or 60 Hz, depending on choice of interchangeable motor pulley
Supply voltage:	110, 117 or 220 volts, switchable
Drive system:	4-pole, split-pole synchronous motor with radially located elastic mounts. Transmission to turntable platter via highly wear resistant, compliant idler wheel
Power consumption: (unloaded)	approx. 10 watts
Current consumption: (unloaded)	at 220 volts, 50 Hz: approx. 62 mA at 117 volts, 60 Hz: approx.115 mA
Turntable platter:	non-magnetic, 3,1 kg (6,8 lb), 305 mm (12 in.) diameter. Moment of inertia: 4 x 10^5 gram cm/sec^2
Turntable speeds:	33 1/3, 45 and 78 rpm
Pitch adjustment range:	6 % on all three speeds (approx. 1 musical semitone)
Speed variation: (flutter and wow)	± 0,06 % according to DIN 45 507
Rumble and other noise:	unweighted - 45 dB weighted - 60 dB } according to DIN 45 500
Tonearm:	torsionally rigid, all-metal construction extra-long, in 4-point gimbals
Cartridge holder:	removable, accepts all types of cartridges weighting between 1 and 12 grams and having internationally standard 1/2" mounting centers. Perforated metal construction. Overhang adjustable over 6 mm
Effective tonearm length:	222 mm (8 3/4 in.)
Tracking error:	1° 30' at groove radii between 55 and 146 mm (2.6 and 5.75 in.)
Pivot friction:	vertical 0.007 grams horicontal 0.015 grams } referred to stylus tip
Weight:	6.8 kg (15 lbs) less packing
Mounting dimensions and mounting-board cut-out:	obtainable from mounting instructions

Fig. 2 Motor suspension and turntable platter drive



Motor and drive

Power for the turntable platter and the changing mechanism is supplied by a four-pole, split-pole synchronous motor suspended by radially located elastic mounts and having a very small stray magnetic field as well as little vibration.

The speed of the motor is independent of line-voltage, temperature or load variations. Speed is dependent on, and proportional to power-line frequency. The motor is adapted to 50 or 60 cycle (Hz) power-line frequencies by the correct choice of the motor pulley.

Motor pulley for 50 Hz operation: part no. 218 275
Motor pulley for 60 Hz operation: part no. 218 276

The motor pulley is fastened to the motor shaft by a setscrew. When you change pulleys, be sure that the new pulley is set at the correct height (see page 5). The turntable platter is driven by the idler wheel (105), which, to prevent damage to its friction surfaces, is automatically disengaged when the unit is shut off. Setting the turntable speed to 33 1/3, 45 or 78 rpm is done by raising or lowering the idler to bear against the proper step of the motor pulley.
When the operating switch (8) is actuated, the switch segment (110) rotates, whereupon the switch (103) that runs in the groove of the switch segment is brought to bear upon the drive wheel (105), lifted off the motor pulley (117) and moved vertically to the proper step on the motor pulley, corresponding to the selected speed.

Fig. 3 Motor field connections (without voltage selector)

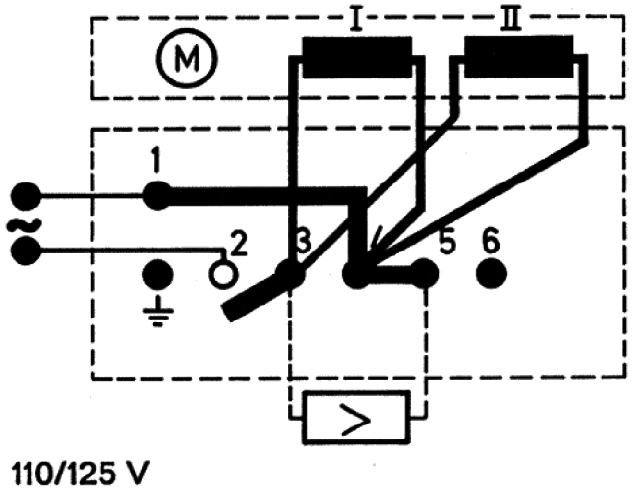
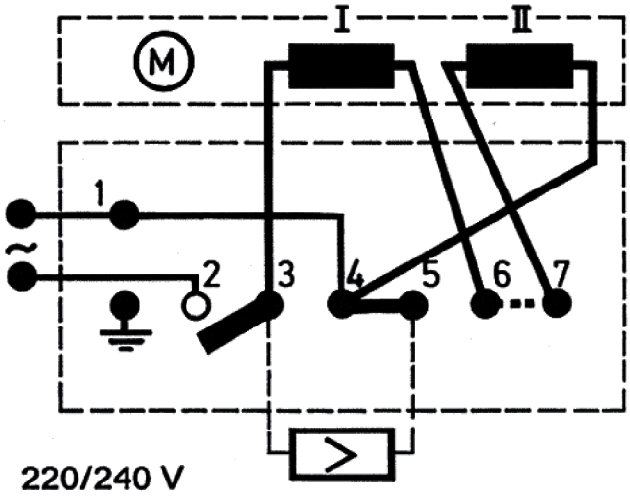


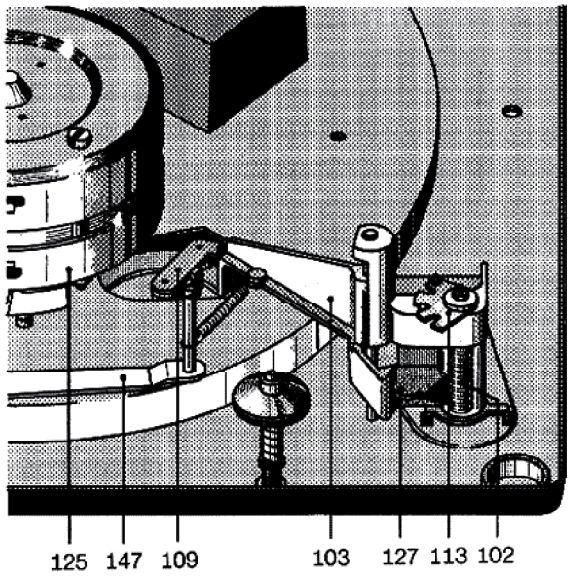
Fig. 4 Motor field connections (with voltage selector)



Fine - speed adjustment

A fine-speed adjustment for all three speeds permits a platterspeed variation of 6 % (about 1 semitone), independent of supply voltage. Turning the pitch-control knob (9) causes the selector segment (110) to rotate. The switch lever assembly (103) moves up and down, changing the position of the idler wheel on whatever motor pulley step it has been placed on. The tapered shape of the motor pulley gives an adjustment range of ± 3 % from the nominal speed.

Fig. 5 Drive-wheel shift mechanism and turntable speeds



Symptom	Cause	Remedy
Turntable does not run when unit is plugged in and start switch operated	a) Current path to motor interrupted	a) Check connection at switch plate and voltage selector
	b) Idler wheel (105) not in contact with platter	b) Check switch lever assembly (103)
	c) Motor pulley loose	c) Tighten motor pulley
Turntable does not come up to speed	a) Motor pulley is not correct for local line frequency	a) Change motor pulley
	b) Slippage between idler wheel (105) and motor pulley or platter	b) Clean friction surfaces of idler wheel, motor pulley and turntable platter. If necessary, replace drive wheel. Once the drive surface of the platter has been cleaned, do not touch it with your fingers.
	c) Excessive friction in motor, drive wheel or platter bearings	c) Clean and oil bearings
Rumble in reproduction	Worn idler wheel	Replace idler wheel (105) and clean platter drive surface and motor pulley with greaseless solvent. Once surfaces are cleaned, do not touch them with your fingers.

Symptom

Correct nominal speed obtained only at extreme settings of pitch control

Cause

Idler wheel does not contact motor pulley correctly

Remedy

Adjust the motor pulley vertically after loosening its setscrew (118) by turning screw (116). The correct position for the idler is in the center of each motor pulley step, when the pitch control is centered in its range (Fig. 6). Retighten setscrew after adjustments.

Fig. 6 Motor pulley position

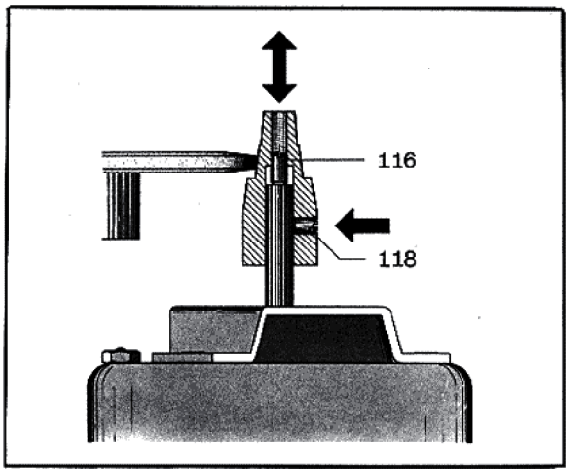


Fig. 7 Tonearm bearing assembly

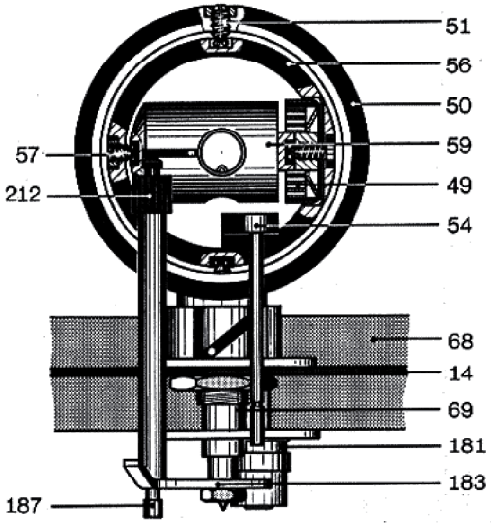
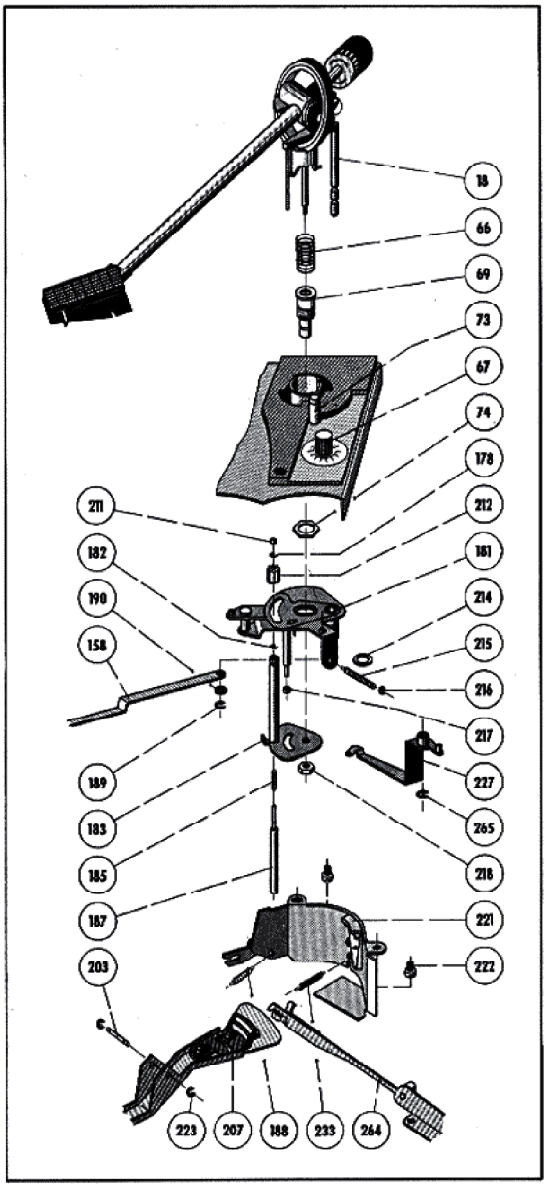


Fig. 8 Tonearm assembly



The tonearm and its suspension

The all-metal extra long "studio" tonearm of the Dual 1219 pivots both horizontally and vertically on needle bearings and precision ball bearings in hardened and polished races. It is suspended in a gimbals arrangement. This keeps friction to a minimum.

Vertical pivot friction = 0.007 gram
Horizontal pivot friction = 0.015 gram
referred to stylus tip

The arm is thus able to track extremely well. The tonearm head is removable. Before setting the tracking force for the cartridge being used, set the tracking-force scale to zero and balance the tonearm.

You can balance it by sliding the counterweight (45). You can balance cartridges with a weight of 1 to 12 grams. To reduce the effects of small shock impulses to the arm, the counterbalance weight is elastically mounted on a threaded spindle, and friction-braket to prevent undesired rotation.

The cartridge holder will accept all cartridges with standard mounting centers of 1/2 inch. Stylus force is set by turning a calibrated dial (49), which stresses or releases a spiral spring contained inside. The dial covers a stylus-force range of zero to 5.5 grams and is marked over that range in 0.25 gram steps.

To replace the tonearm and bearing assembly, follow these steps:

1. Set stylus force dial to zero and mode selector to "single".
2. Fasten unit in repair jig and turn it bottom side up.
3. Unsolder tonearm leads.
4. Remove main lever (207) and linking lever (264).
5. Unhook springs (188, 215, 233) and unscrew protective plate (221).
6. Remove washer (265) and skating lever (227).
7. After removing washers (189) and (190), remove shut-off slide (158) from segment (181).
8. Loosen hex nut (218). Lift up guide (211), also the "C" ring on units from no. 141 000 and up.
   The complete segment can be removed after first unscrewing the positioning sleeve (212) and lift plate with lift bolt (183).
9. Turn the unit back in its normal position.
10. Set mode selector on "multi", then rotate the outer bearing ring (50) counter-clockwise until it cannot turn any more. The tonearm can then be lifted out.

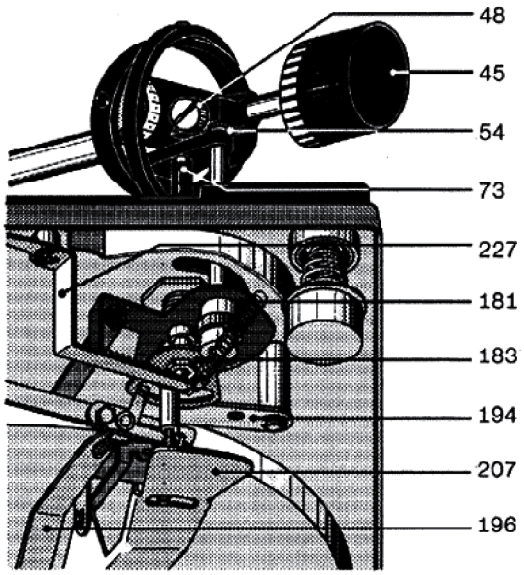
To replace the tonearm bearing assembly hold it fast with a suitable tool (such as a pair of flat-nose pliers) and loosen hex nut (74) with an open-end wrench. Be sure to secure the bearing socket with a 5 mm rod to prevent its being pinched together.

Reverse the procedure to reassemble the tonearm and bearing. The unit must be right-side up. Do not omit spring (66)! After assembly, immediately place the mode selector at "single". This prevents the tonearm from falling out when the unit is turned upside down again. Install segment (181) and lift plate (183). Tight the positioning sleeve (212) onto the lift bolt and mount the guide (211) again. Use the "C" ring on units from no. 141 000 and up only. Before tightening hex nut (218), rotate outer bearing ring (50) counter-clockwise until you feel slight resistance. This puts the forward edge of the outer bearing ring at the center line of the inner tonearm bearing screw.

After reinstalling the protective plate be sure that the segment (181) moves freely and without rubbing in its guide (219) and is not hindered in its movement by the tonearm wires. Adjust tonearm height with positioning sleeve (212) and locating screw (54) on "multi" position on the mode selector.

(Measured at tonearm head. See Fig. 11).

Fig. 9 Tonearm bearing assembly viewed from underneath



Anti-skating adjustment

The tendency of a tonearm with an offset (angled) head to "skate" inward across the record is eliminated in the Dual 1219 by a precision anti-skating mechanism. Skating force depends on tonearm geometry, stylus force and the tip radius of the stylus. The inward pull on the tonearm caused by the skating effect gives rise not only to an undesireable jumping of the tonearm when it is set down on the record, but also to unequal forces on the two opposite groove walls, with corresponding ill effects. This can be corrected with proper anti-skating adjustment.

By turning the anti-skating adjustment knob (67) on the chassis, an asymmetrical curved washer (225) is turned. This washer has two different curved surfaces corresponding, respectively, to the red and black scales on the anti-skating dial. The red scale is for conical (spherical-tip) styli, the black for elliptical (bi-radial) styli. When the knob is turned, the curved surfaces push the anti-skating lever (227) away from its rest position so that it applies a suitable counter-force via a spring (215).

Skating compensation is set at the factory for conical styli with a tip radius of 0.6 to 0.7 mil. (.0006-.0007 inch), and for elliptical styli with measurements of 0.20 to 0.23 mil by 0.79 to 0.87 mil. The adjusting hex nut (226) is tightened and sealed. Readjustments should be attempted only with the help of the Dual Skate-o-meter and test record L 096. This work is best done by an authorized Dual service agency.

Fig. 10 Anti-skating force

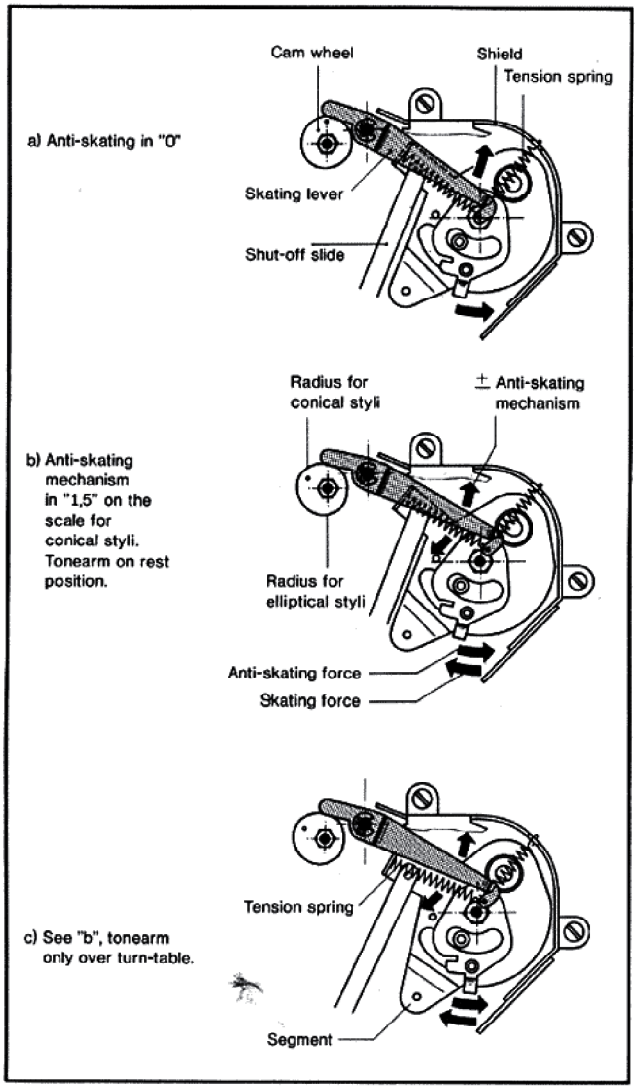
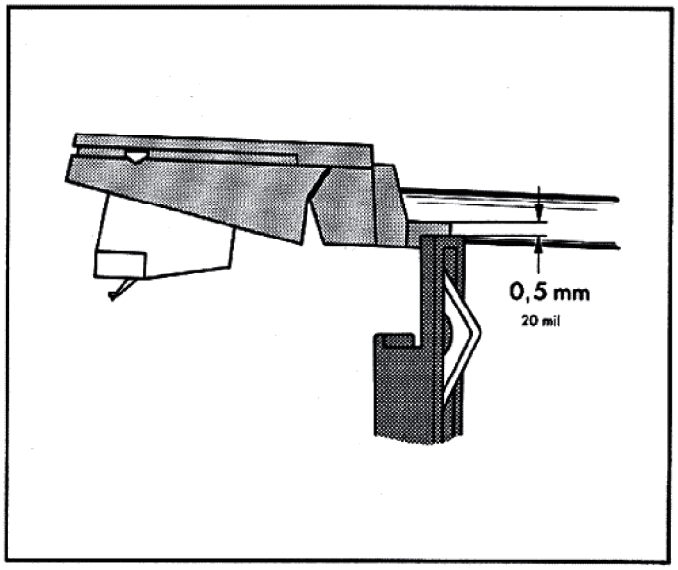


Fig. 11



Symptom

During change cycle, tonearm binds horizontally

Cause

Positioning sleeve or locating screw misadjusted

Remedy

With main lever (207) pressed, adjust bushing nut so that, with the tonearm unlocked and hanging over the rest, the above edge of the tonearm rest piece and the above edge of the tonearm rest are at an equal height. Now adjust a play of 0.1 - 0.2 mm between guide (211) and the tonearm's bearing surface by means of the locating screw (54).

(Measured 0.5 mm at tonearm head, see Fig. 11)

Symptom	Cause	Remedy
Stylus skips	a) Tonearm not balanced	a) Balance tonearm according to operating instructions
	b) Stylus force too low	b) Set stylus force to cartridge manufacturer's recommended value
	c) Anti-skating wrongly adjusted	c) See instruction booklet
	d) Stylus worn or chipped	d) Replace stylus
	e) Excessive friction in tonearm bearing	e) Check tonearm pivot. Should have barely noticeable play. Adjust vertical bearing only with the left bearing screw (57) and the horizontal bearing with nut (52). Horizontal bearing is correctly adjusted when the tonearm, with anti-skating set at 0.5 gram, swings freely from center to rest.
	f) Ball (159) missing from shut-off rail	f) Replace ball (159)
	g) Segment (181) rubs in its guide (219)	g) Adjust guide (219). Adjustment is correct when the tonearm moves freely in the horizontal plane at both settings of the mode selector
Vertical movement of tonearm is impeded during set-down cycle	a) Bearing friction too high	a) Check bearing screw (57) and arm balance
	b) Lift screw (187) jams in guide sleeve of arm segment (183)	b) Remove and clean lift screw. Clean guide sleeve and fill lift tube with "Wacker Silicon Oil AK 300 000"

Tonearm movements

A guide groove located on the underside of the main cam (251) controls the automatic lift and set-down of the tonearm as the cam rotates through 360°. Tonearm lift and lowering are controlled by the main lever (207) and the lift screw (187). Horizontal movements are controlled by the main lever (207) and the segment (181). Setting the changer for playback of 7", 10" or 12" discs is done with the indexing lever (63). Set-down points are determined by the eccentric portion of the arm positioning slide (259) and the indexing lever (260).

Horizontal movement of the tonearm is limited by the arm segment striking the arm positioning slide (259). During the change cycle, the main lever (207) raises the arm positioning slide, bringing it within reach of the spring stud. On completion of the change cycle (set-down of the tonearm on the record), the arm positioning slide (259) is again released and returns to its normal position. It thus moves out of reach of the spring stud, permitting the tonearm to move horizontally without hindrance, while playing the record.

Fig. 12 Tonearm guide mechanism

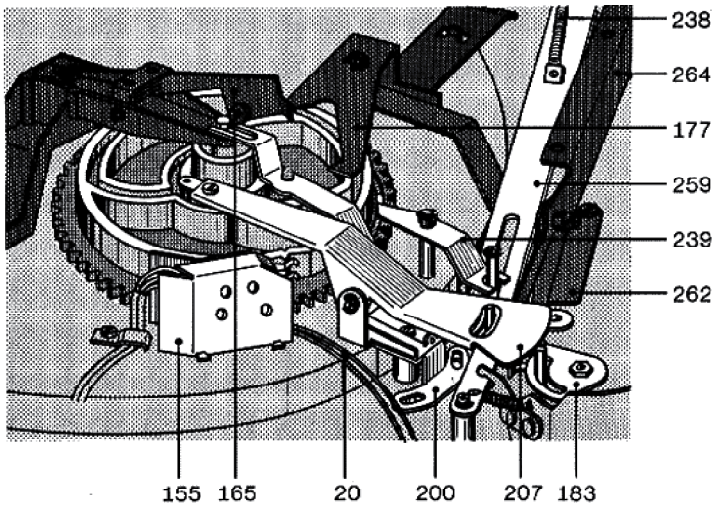
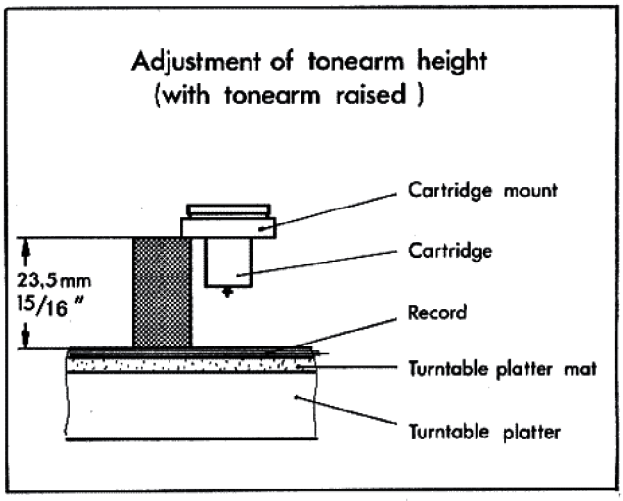


Fig. 13



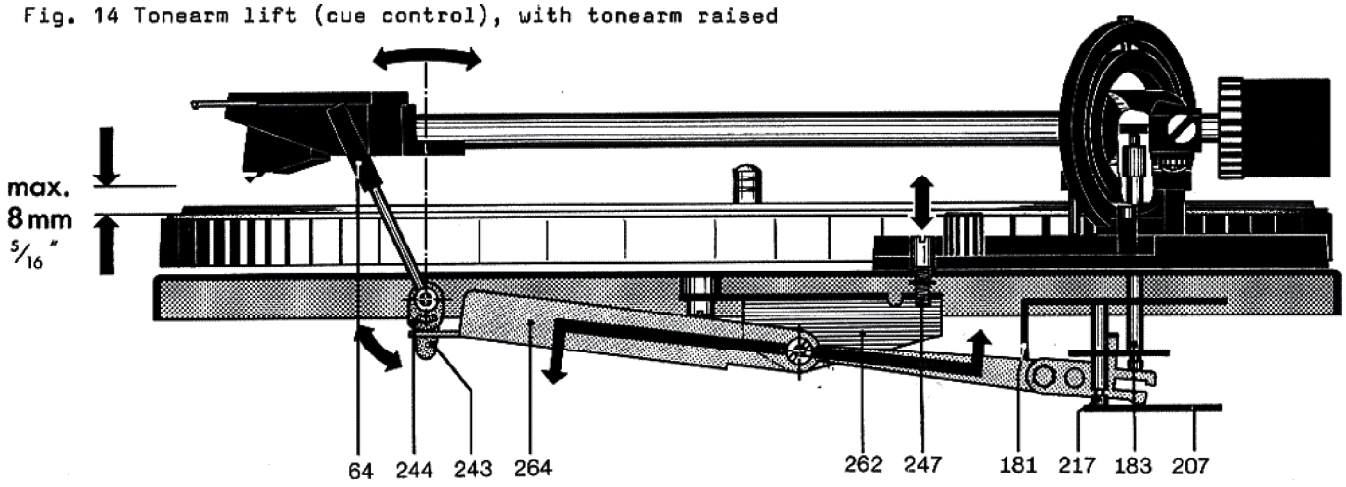
Tonearm lift (Cue control)

The tonearm lift permits the tonearm to be set down on the record safely at any desired point except the shut-off area (near the record label). In units numbering 141 000 and up, the tonearm lift will also function in the "multi" position of the mode selector.

Pulling the tonearm lift towards the front turns the drive washer (244). This moves the connecting lever (264), and lift screw (187) to raise the tonearm.

After the tonearm is moved (by hand) to the desired spot on the record, the tonearm lift handle is lightly tapped towards the rear to release the mechanism. The connecting lever (264) and the leaf spring (185) of the lift screw (187) are freed, allowing the tonearm to fall. The rate of fall is controlled by silicone oil in the lift tube. The height of the stylus above the record can be varied by adjusting setscrew (247). Turning it to the right increases the height, turning it to the left decreases the height. In any case, units leaving the factory are adjusted so that the tonearm lifted off the fifth record on the platter.

Fig. 14 Tonearm lift (cue control), with tonearm raised



Symptom	Cause	Remedy
Tonearm misses edge of record	a) Record size incorrectly set	a) Set record-size selector
	b) Set-down incorrectly adjusted	b) Adjust set-down with a 12" record so that stylus touches record approximately 1/16" inside edge of record. Adjustment will be correct for other sizes.
	c) Record not standard size	c) Use standard records
	d) Friction surfaces of tonearm clutch dirty	d) Clean clutch surfaces
Tonearm strikes record during change cycle	Tonearm height incorrectly set	Adjust it by turning rear adjustment screw (54). Adjustment is correct when in "multi" position, with tonearm unlocked and on its rest, the upper edge of the tonearm support is about 0.5 mm (.02 in.) above the upper edge of the tonearm bracket. (See fig. 11)
Tonearm does not move on to record when drop cycle is started	Damping too great, dirty oil in lift tube	Remove lift plate according to instructions in the section "The tonearm and its suspension".Clean lift tube and bolt and fill tube with "Wacker Silicon Oil AK 300 000".
Tonearm lowers too quickly when drop cycle is started	Too little damping	Follow instructions above for too great damping
Tonearm returns to rest immediately after being placed on record manually	Shut-off mechanism has shifted out of position during shipping	Before using changer after moving, run it through start cycle with tonearm locked on rest.

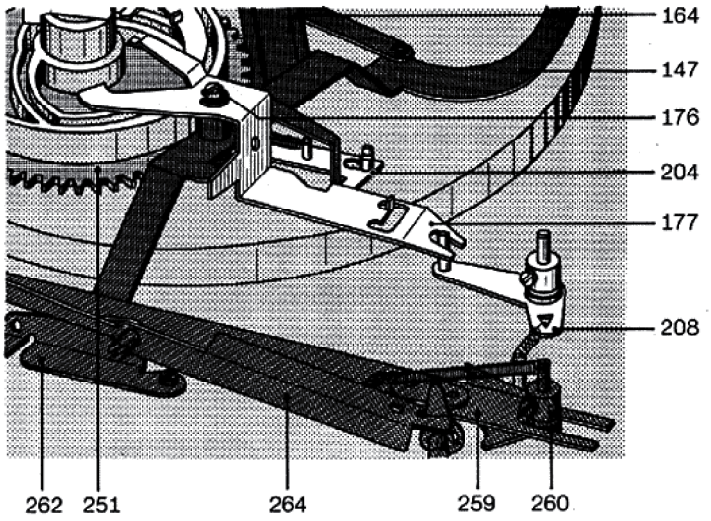
Start cycle

Moving the start switch (62) moves the switch lever (177) clockwise, initiating the following sequence.

a) The set screw of the switch lever assembly (177) turns the switch arm (147) mounted on the grooved shaft (176). Via a tension spring, this actuates the rocker assembly (103) and engages the idler (105) between the platter (7) and the motor pulley (117). At the same time, the power switch (140) is actuated by the switch slide (131) through the switch arm, and the turntable begins to rotate.

b) The switch lever (177) is brought within reach of the cam follower lever (254), so that it is pushed into the change position after the rotation of the main cam.

Fig. 15 Start position



Moving the operating switch also releases the start lever (204), pulling it towards the main cam by means of the tension spring (206). This causes coil spring to bring the shut-off lever (231) within range of the main cam dog. Thus the shut-off lever drives the main cam (251).

To prevent malfunctioning, the operating switch is locked during the start cycle (that is, while the main cam is turning). Just before the main cam reaches its neutral position (at the end of the change cycle), the start lever (204) is pushed clear of the main cam by the angular part of the main cam. This restores the switch lever and operating switch to their original positions.

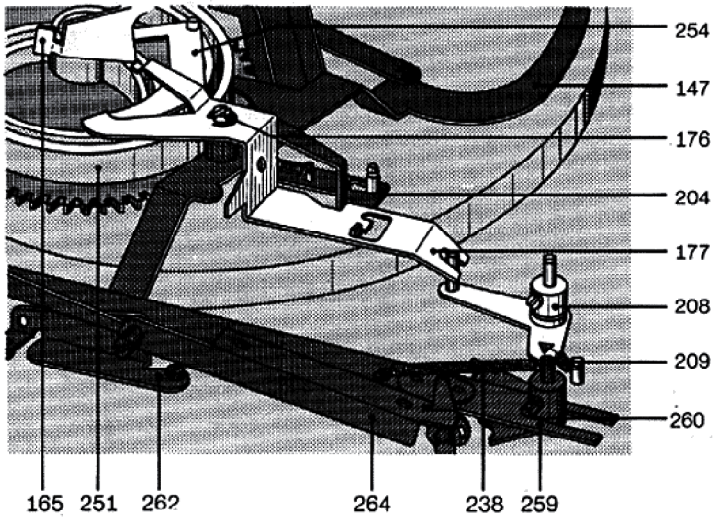
After installation and also after moving the changer, the unit should be started with the tonearm locked on the rest. This will automatically re-adjust the shut-off lever, which may have shifted out of position.

Manual start

When the tonearm is swung inward by hand, the pawl (255) on the switch arm (147) drops into a square bolt on the base plate, holding the switch arm in this position and the idler wheel (105) in contact with the platter. The slide (131) linked with the switch arm actuates the power switch and sets the turntable platter rotating.

On reaching the run-out groove, the tonearm automatically returns to its rest position and the unit shuts itself off. However, if the tonearm is lifted off the record manually and returned to the rest, the tabs of the arm segment (181) release the pawl (255). The torsion spring (168) then returns the switch arm to its initial position, opening the power switch and disengaging the idler wheel.

Fig. 16 Stop position

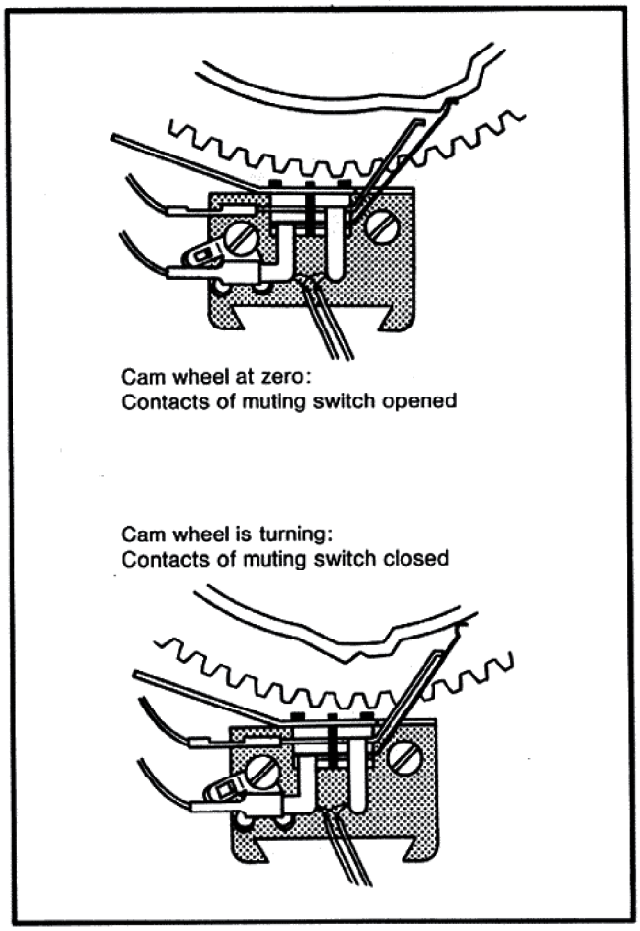


Stop switching

When the operating lever is moved to "stop", the starting lever is pushed forward. As a result the shut-off linkage comes into contact with the main cam. The swinging lever remains in its stop position.

When the tonearm is on its rest and the operating lever is pushed to "stop", the operating lever must not jam.

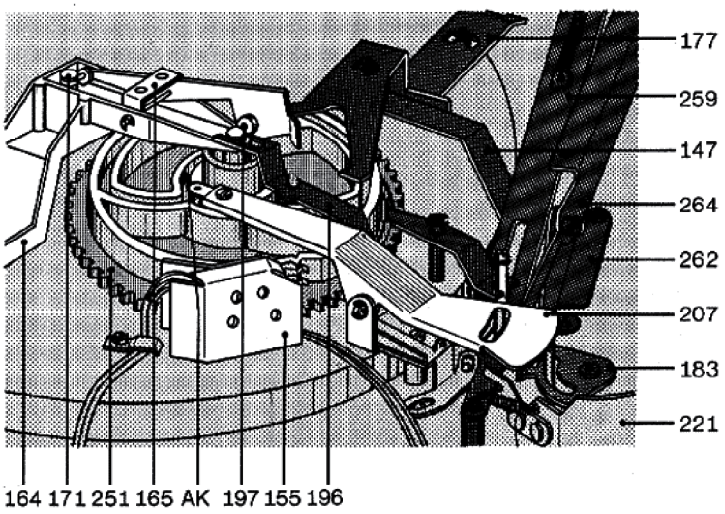
Fig. 17. Muting switch



Muting switch

To prevent the noises of the change cycle from being sent through the audio system, the apparatus is fitted with a short-circuiting (muting) switch. The switch springs for both channels are actuated by the main cam. In the tonearm rest position, the muting switch is opened.

Fig. 18 Record drop



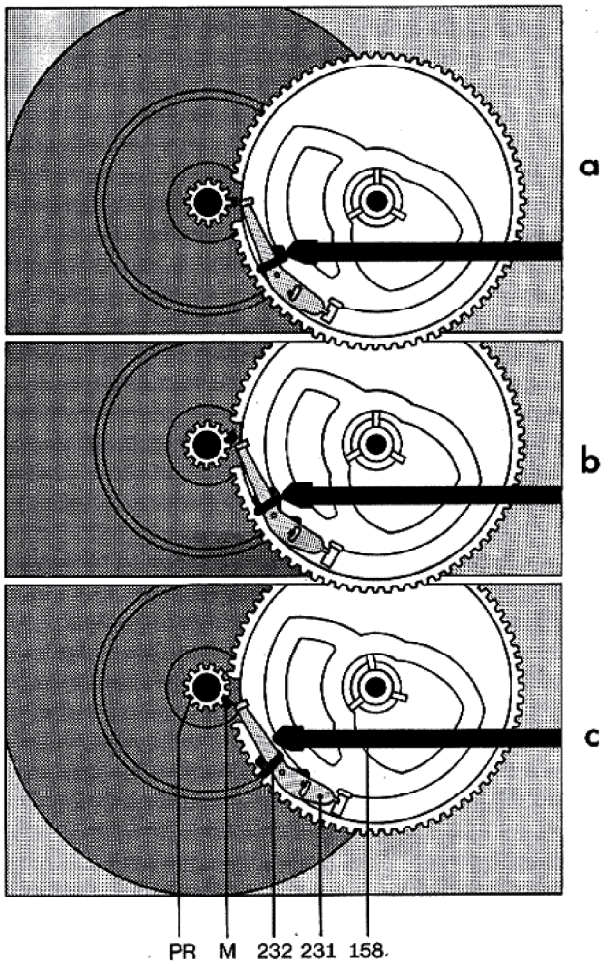
Record drop

Insert the appropriate spindle - AW 3 for standard records (7 mm or 1/4" center hole) or AS 12 for 45 rpm records (38 mm or 1 1/2" center hole).

To prevent faulty operation, automatic record-changing operation is possible only when the mode selector is in the "multi" position.

Record-drop is initiated by the rotation of cam (251), whose cam surface (AK) guides the cam rocker (165), pushing the change actuator stud (171) and releasing a record by means of the automatic spindle. The main cam is designed so that a record can drop only when the tonearm is above the tonearm rest and thus out of the reach of the largest possible record (12" diameter).

Fig. 19 Actuating change or shut-off operations



Shut-off and change cycle

The dog (M) on the turntable platter gear (PR) and the shut-off lever (231) actuate both the change cycle at the end of the record as well as the shut-off after the last record in a stack is played.

At the end of a record, the tonearm moves towards the center at an accelerated rate due to the increased pitch of the grooves. This motion carries the shut-off lever (231) towards the dog by means of the shut-off slide (158). The eccentric dog pushes the shut-off lever (231) back at each revolution as long as the tonearm advance is only one normal record groove.

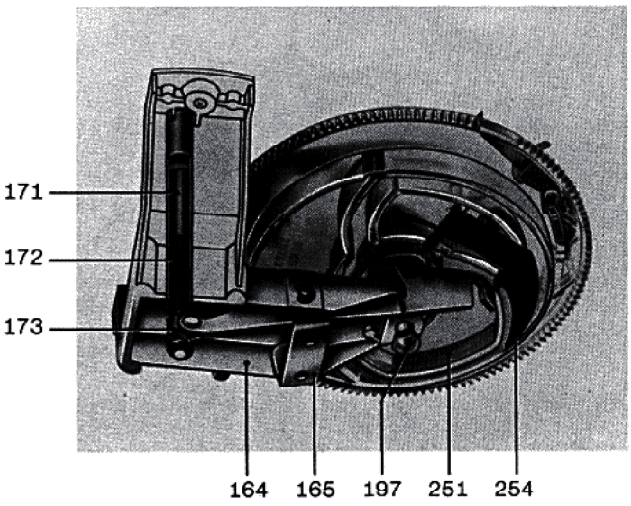
The run-out groove with its steeper pitch moves the shut-off lever against the dog with greater force, engaging the shut-off lever (231) and causing the main cam (251) to be driven out of its neutral position by the turntable platter gear.

Shut-off mechanism

Shut-off and change functions are determined by the position of the cam follower lever (254). After every start or record-drop, the cam follower lever is brought to its stop position by the main lever (207) (longer end towards the center of the main cam). As the record is dropped the cam follower lever (254) is turned to its start position by the cam rocker (165), so that the tonearm can swing in toward the record and be lowered on to it. If there are no more records on the spindle, and the cam rocker cannot turn the cam follower lever, the lever remains in its stop position and allows the tonearm to swing to its rest position.

When the main cam (251) returns to its neutral position, the switch arm (147) drops into a cut-out in the main cam, opening the power switch (140) and disengaging the drive idler (105).

Fig. 20 Change cycle



Symptom

Turntable stops after automatic set-down of the tonearm.

Cause

a) Switch arm (147) is not latched by pawl (255). Bolt of segment slips over pawl instead engaging it.

b) Power switch opens.

c) Square bar not properly screwed. Pawl disconnected.

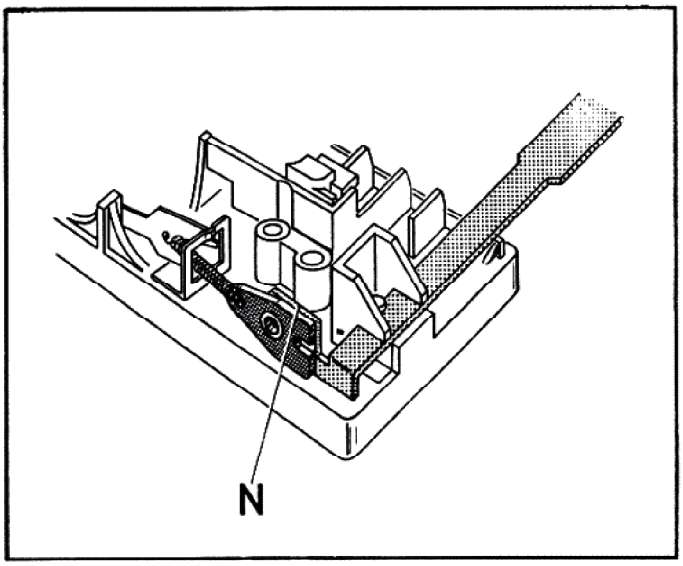
Remedy

a) Adjust segment (181) so that bolt catches pawl in both positions of mode selector.

b) As the tonearm moves in, switch slide (131) must overtravel by about 0.3 – 0.5 mm. If necessary: adjust part (N) or switch slide (131) on power switch.

c) Loosen screw (258). Press pawl against square bar (256), see fig. 22, and fasten screw.

Fig. 21



Symptom

Tonearm misses record during cycling when moving in or out.

Cause

Switch arm misadjusted. Pawl touches square bar.

Remedy

After loosening screw (146), twist short part of the switch arm on the long part. Adjustment is correct, when the distance between pawl and square bolt is 0.3 mm (256, mounted on chassis plate) after the tonearm has moved in and the main cam was turned manually.

Fig. 22

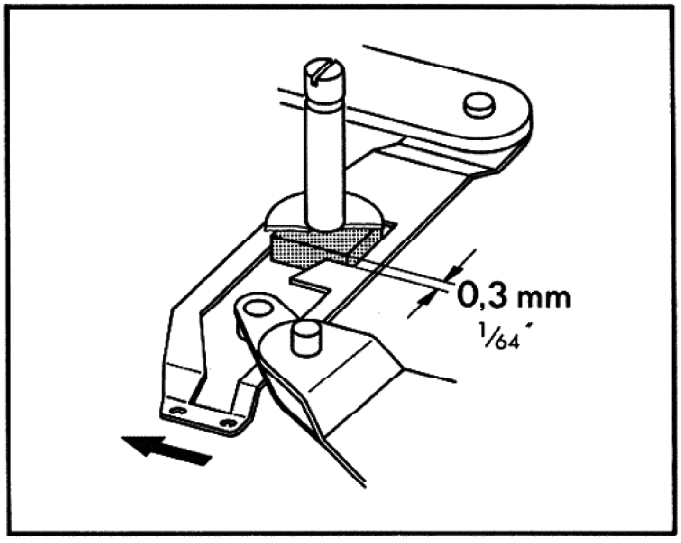
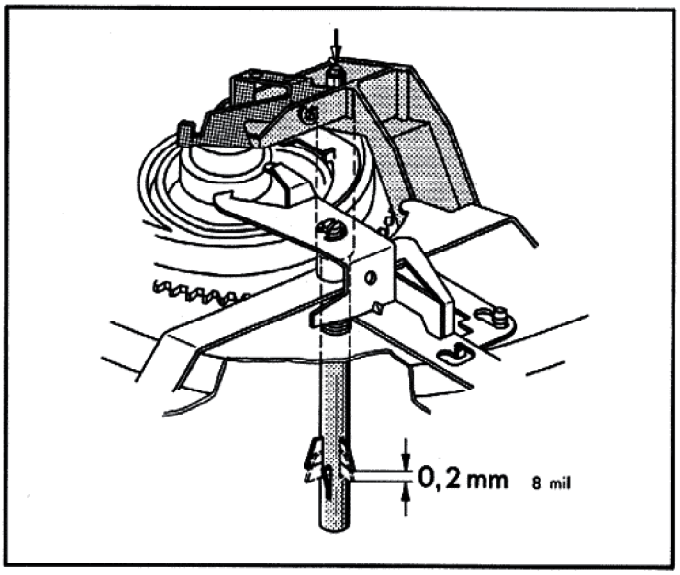


Fig. 23



Symptom

Last record keeps repeating

Cause

Defective spindle

Remedy

Replace spindle

Symptom

Records do not drop

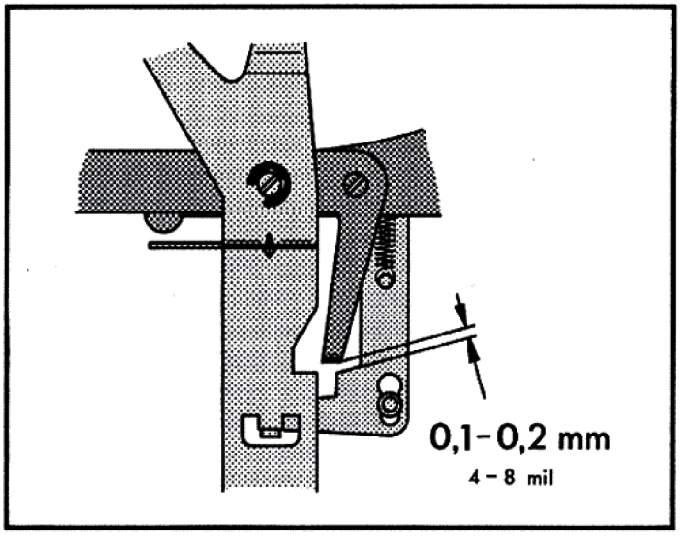
Cause

Cam rocker has too little force (travel)

Remedy

Readjust eccentric so that when the three supports in the automatic spindle are held in and the main cam is at its neutral, pressing the change screw moves the support about 0.2 mm (1/64").

Fig. 24



Symptom

Switch latches into "stop" position when tonearm is at rest

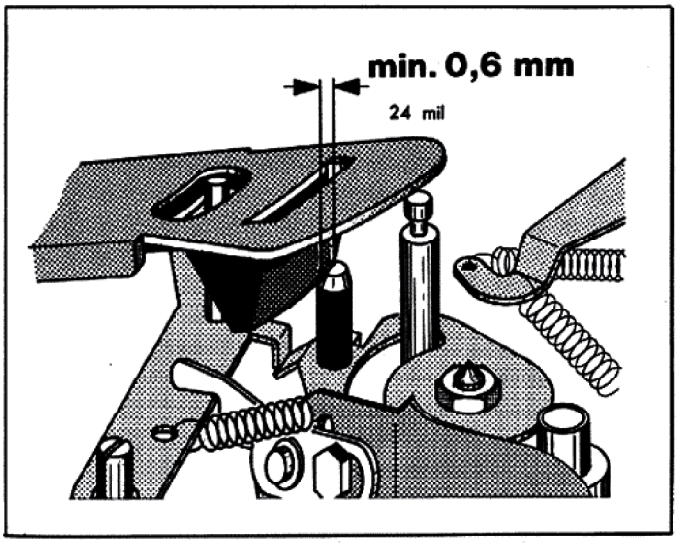
Cause

Too much clearance between tab on switch arm (147) and start lever (204).

Remedy

Adjust tab on switch arm so that it clears start lever by 0.1 - 0.2 mm or 1/64 " when main cam is in neutral position.

Fig. 25



Symptom

Tonearm doesn't raise from the tonearm rest with mode selector in "multi" position.

Cause

Equalizing arm misadjusted. Balance plate (242) at the main lever (207) doesn't contact with the lifting bolt.

Remedy

Adjust equalizing arm on the eccentric piece of the protecting plate so that with the main lever pushed down, the balance plate sits a minimum of 0.6 - 0.8 mm on the lift bolt. When setting on "single" position, the lift bolt must slide along the balance plate without hindrance.

Symptom	Cause	Remedy
Tonearm moves with stylus force and anti-skating force at zero:		
a) outward	a) Anti-skating out of adjustment	a) Adjust skating lever so that skating spring applies force exactly at tonearm pivot
b) inward	b) Too taut tonearm leads produce a twisting force	b) Allow some slack in tonearm leads
During change, stop and start operations, noises from the mechanism can be heard in the speaker system	Muting switch misadjusted. Distance between contact springs and shorting contact is too great	Bend contacts so that, in the neutral position of the main cam the spacing between contacts is about 0.5 mm or 0.02 inch. Clean contacts.
No sound; muting short circuit across pick-up leads is not opened	Muting switch contact spacing too small	Bend contacts so that, in the neutral position of the main cam the spacing between contacts is about 0.5 mm or 0.02 inch. Clean contacts.
Motor will not shut off when tonearm is on arm rest	Capacitor across power switch is shorted	Replace capacitor (.01 µF, 700 V)
Acoustic feedback	a) Chassis parts (for example leads) are touching base cut-out	a) Correct cut-out according to instructions supplied with unit. Move cables.
	b) Connecting cables are too taut	b) Allow more slack in cables
With mode selector in "single" and short spindle in place, tonearm does not move in toward record on automatic single-play operations	Switch spring on locking slide (196) is misadjusted	With the unit in normal upright position, adjust spring so that when the main cam is rotated the raised tab on the switch lever is just cleared.
Records do not drop with changer spindle in place	Mode selector is set to "single"	This is normal
Tonearm lift (cue control) will not function	Mode selector is set to "multi"	This is normal (up to unit no. 140 999)

Spare parts

Ref.No.	Part No.	Description	Quantity	
1	215 470	Automatic spindle, AS 12	1	
2	213 895	Automatic spindle, AW 3	1	
3	217 685	Stroboscope ring, 50 Hz	1	
	201 208	Retaining ring	1	
4	216 506	Washer	1	
5	200 543	Spring washer	1	
6	218 310	Turntable platter mat complete with 50 Hz stroboscope ring	1	
	218 670	Turntable platter mat complete with retaining ring	1	
7	218 669	Turntable platter complete with mat and retaining ring	1	
	218 244	Turntable platter complete with mat and stroboscope ring for 50 Hz	1	
8	216 742	Left-hand switch lever, complete (speed selector)	1	
9	216 741	Pitch-control knob	1	
10	216 740	C-washer H 7 x 0,8	1	
11	218 304	Control washer complete	1	
12	218 480	Safety washer	1	

Ref.No.	Part No.	Description	Quantity	
13	219 036	Mask (inch measure)	1	
	219 037	Mask (metric)	1	
14	220 711	Chassis, complete	1	
15	214 047	Special screw (pierced for spring washer)	3	
	214 211	Special screw (threaded)	3	
16	220 213	Centering disc	1	
17	201 101	Single play spindle	1	
18		Tonearm complete with bearing ring and ring, is available only separately as items 43-57		
19	219 065	Tonearm head complete	1	
20	218 296	Contact plate complete	1	
21	201 132	Grip	1	
22	210 182	Safety washer	1	
23	210 630	Washer 4.2/8/0.5 St	1	
24	210 197	Ring G 4 x 0.8	1	
25	219 927	Rest, complete	1	
26	217 439	Crosspiece	1	
27	217 504	Stud	1	
28	210 362	Hex nut BM 3	6	
29	216 510	Leaf spring	1	
30	210 362	Hex nut BM 3	6	
31	216 511	Threaded bolt	1	
32	213 512	Hex-head screw M 4 x 8	2	
33	213 512	Hex-head screw M 4 x 8	2	
34	210 366	Hex nut BM 4	8	
35	210 362	Hex nut BM 3	6	
36	210 362	Hex nut BM 3	6	
37	210 624	Washer 4.2/7/0.3 St	6	
38	200 718	Spring	3	
39	210 624	Washer 4.2/7/0.3 St	6	
40	201 632	Rubber washer	3	
41	200 713	Washer	3	
42	200 712	Spring cup	3	
43	200 711	Spring ring	3	
44	210 366	Hex nut BM 4	8	
45	218 243	Weight, complete	1	
47	217 305	Stud with lockwasher	1	
48	216 545	Clamp bolt	1	
49	218 297	Spring housing, complete	1	
50	218 518	Ring, complete	1	
51	216 830	Threaded rod	2	
52	216 834	Locknut, high	1	
53	216 829	Bearing screw	1	
54	217 600	Locating screw	1	
55	218 894	Safety washer	1	
56	218 335	Bearing ring, complete	1	
57	216 830	Threaded rod	2	
58	216 831	Locknut	1	
59	218 238	Tonearm, complete	1	
60	217 706	Insulating film	1	
61	215 430	Cartridge mount TK 14	1	
62	216 770	Switch lever, right, complete (start-stop)	2	
63	216 770	Switch lever, right, complete (record size)	2	
64	216 881	Lever, complete	1	
65	210 353	Hex nut BM 2	1	
66	218 827	Spring	1	
67	217 410	Knob (up to unit no. 140 999)	1	
	220 898	Knob (units from no. 141 000 and up)	1	
68	218 239	Dress plate, complete (up to unit no. 140 999)	1	
	220 913	Dress plate, complete (units from no. 141 000 and up)	1	
69	216 810	Bearing for tonearm	1	
70	217 381	Rest lever, complete	1	
71	217 386	Tension spring	1	
72	217 385	Roller	1	
73	217 601	Locating lever, complete	1	
74	218 321	Hex nut	1	
75	213 260	Half-round notched pin, 2 x 6	4	
76	214 210	Shipping fastening assembly, complete	3	
77	217 905	Damping piece	1	
78	200 721	Threaded piece	4	
79	200 728	Compression spring	4	
80	200 723	Rubber damping block	4	
81	200 722	Pot	4	
82	220 163	Spring mount, complete	4	

Fig. 26 Exploded view, above chassis

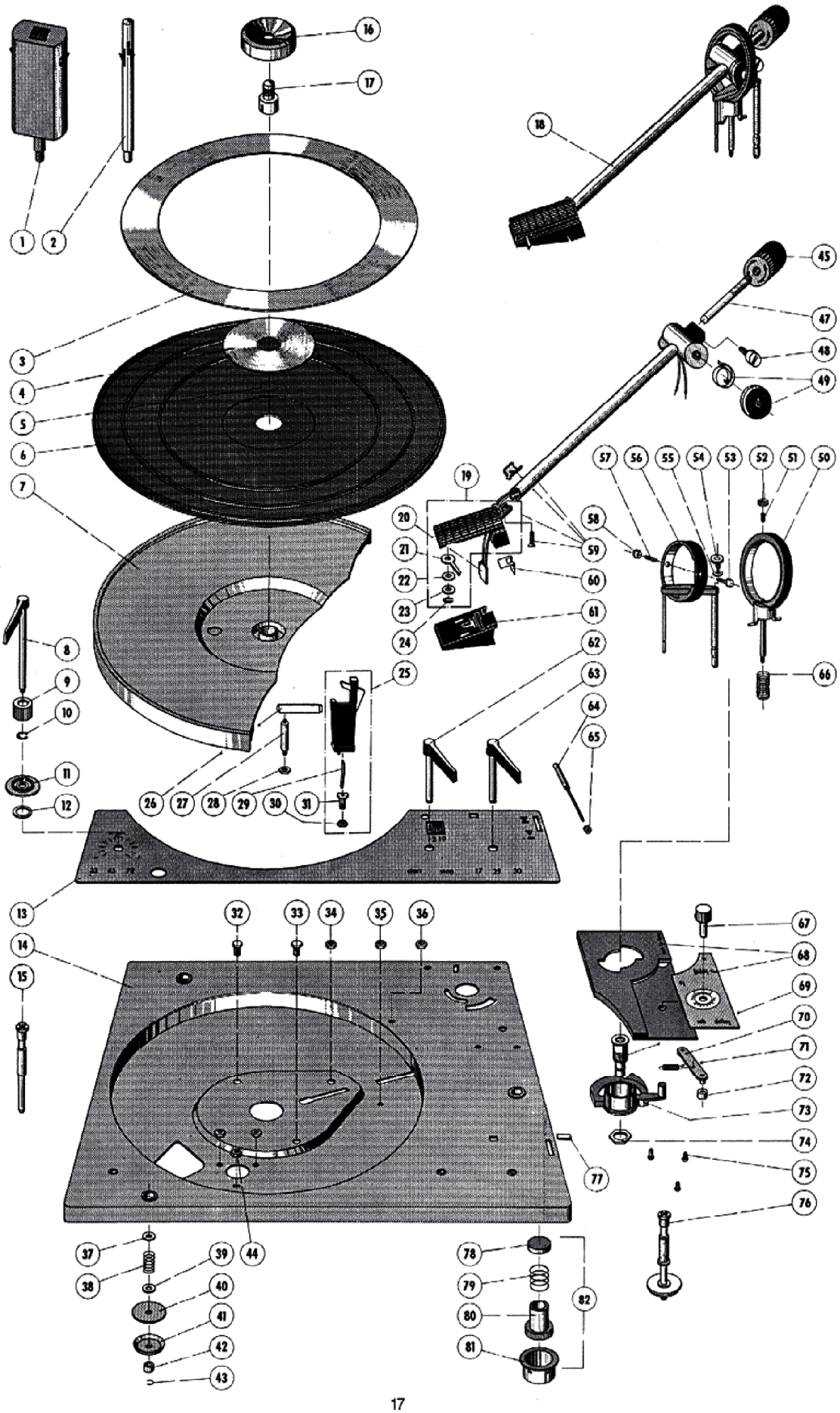
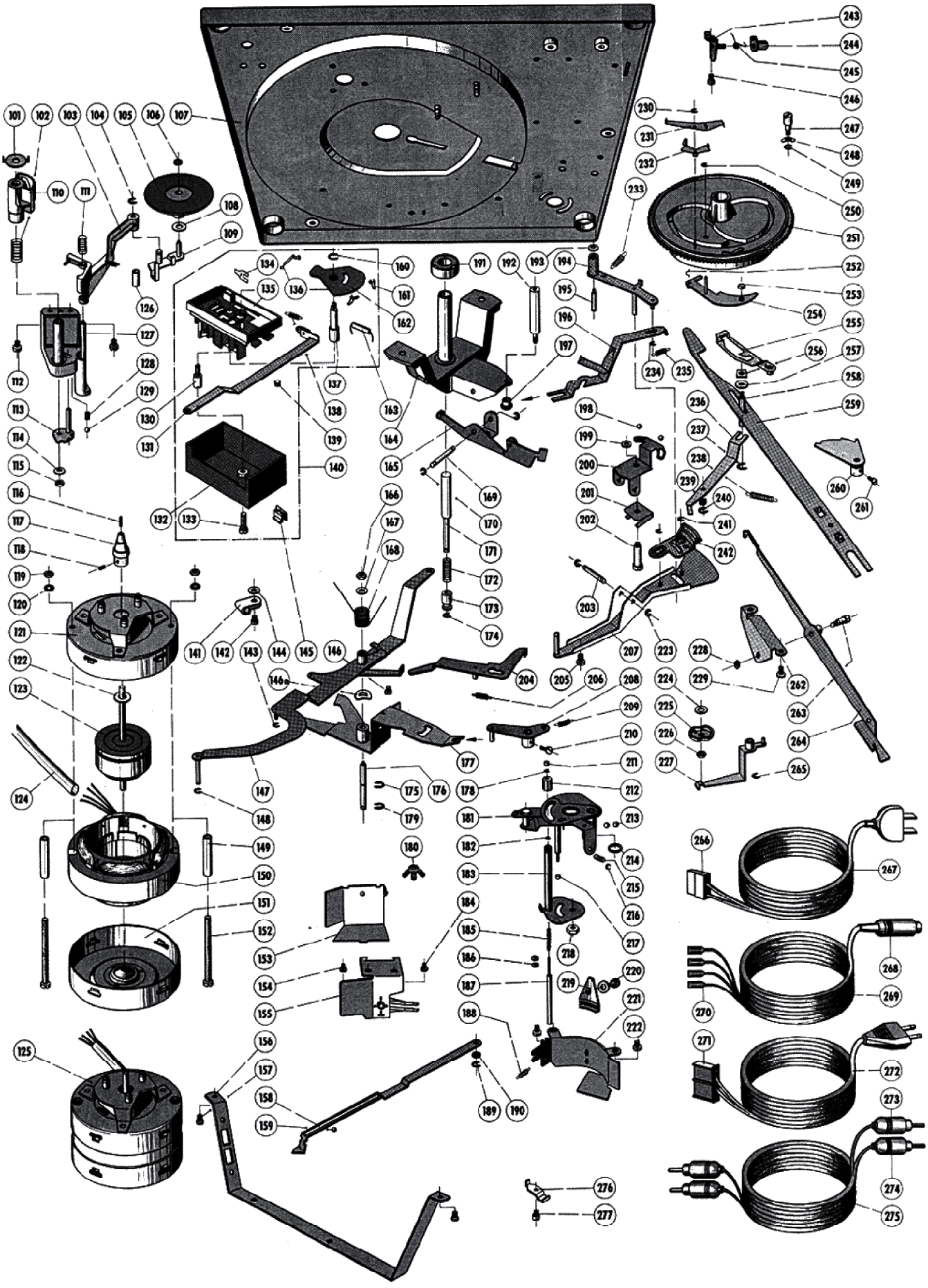


Fig. 27 Exploded view, below chassis



Ref.No.	Part No.	Description	Quantity	
101	216 738	Control	1	
102	216 736	Compression spring for switch segment	1	
103	217 596	Switch lever, complete	1	
104	210 146	C-Washer 3.2	3	
105	218 237	Idler wheel, complete	1	
106	200 633	Safety washer	1	
107	220 711	Installation plate, complete	1	
108	200 110	Friction washer	1	
109	218 700	Swing lever complete with idler-wheel shaft	1	
110	216 735	Switch segment	1	
111	216 737	Compression spring for switch lever	1	
112	210 475	Cylinder-head screw AM 3 x 5	6	
113	216 746	Detent, complete	1	
114	210 642	Washer 4.2/10/1.5 St	1	
115	210 361	Hex nut M 3	2	
116	217 751	Threaded pin, M 2.6 x 8	1	
117	218 275	Motor pulley, complete, 50 Hz	1	
	218 276	Motor pulley, complete, 60 Hz	1	
118	210 220	Threaded pin, M 2.6 x 3.5	1	
119	210 366	Hex nut BM 4	8	
120	210 161	Toothed washer, 4.3	2	
121	216 278	Upper housing, complete	1	
122	220 806	Washer 4.1/12/0.7 F	1	
123	218 322	Armature, complete	1	
124	216 303	Silicone tube	1	
125	218 326	Motor, complete	1	
126	218 702	Insulating tubing	1	
127	216 556	Support, complete	1	
128	218 629	Compression spring for detent	1	
129	209 358	Ball, 4 mm dia.	3	
130	214 181	Screw	1	
131	217 502	Switch slide, complete	1	
132	217 062	Cover for power switch with voltage selector	1	
	214 207	Cover for power switch without voltage selector	1	
133	210 492	Cylinder-head screw AM 3 x 15	1	
134	213 966	Toggle spring	1	
135	217 060	Switch plate with voltage selector, complete	1	
	214 206	Switch plate without voltage selector, complete	1	
136	214 176	Detent spring	1	
137	214 173	Switch shaft	1	
138	213 968	Tension spring	1	
139	218 986	Roller for switch slide	1	
140	218 327	Power switch complete with voltage selector	1	
	214 205	Power switch complete without voltage selector	1	
141	220 152	Plastic clamp for line cord	2	
142	210 475	Cylinder-head screw AM 3 x 5	6	
143	210 145	C-Washer 2.3	14	
144	210 586	Washer 3.2/7/0.5 St	3	
145	213 978	Locking device, small, for power switch housing	1	
	213 979	Locking device, large, for power switch housing	1	
146	210 475	Cylinder-head screw AM 3 x 5	6	
146 a	210 184	Bowed lockwasher	1	
147	218 308	Switch arm, complete	1	
148	210 145	C-Washer 2.3	14	
149	213 510	Insulating tubing	2	
150	218 323	Stator, complete	1	
151	216 276	Lower housing, complete	1	
152	211 553	Cylinder-head screw AM 4 x 48	2	
153	216 901	Metal shield	1	
154	210 475	Cylinder-head screw AM 3 x 5	6	
155	218 242	Muting switch	1	
156	217 530	Stand	1	
	217 801	Stand with phono jacks, complete	1	
157	210 472	Cylinder-head screw AM 3 x 4	3	
158	217 216	Shut-off slide	1	
159	209 358	Ball, 4 mm dia.	3	
160	210 196	C-clip	1	
161	214 175	Contact spring	2	
162	214 174	Contact block	1	
163	203 725	Capacitor, .01 µF, 700 V	1	
164	219 096	Bearing support, complete	1	
165	216 758	Drop mechanism rocker, complete	1	
166	210 362	Hex nut BM 3	5	
167	210 586	Lockwasher 3.2/7/0.5 St	3	
168	216 787	Prong spring	1	
169	217 813	Shaft	1	
170	210 145	C-Washer 2.3	14	

Ref.No.	Part No.	Description	Quantity	
171	216 756	Change bolt, complete	1	
172	213 920	Compression spring	1	
173	213 921	Bushing	1	
174	210 145	C-Washer 2.3	14	
175	210 147	C-Washer 4	3	
176	216 778	Grooved shaft	1	
177	216 788	Switch lever, complete	1	
178	210 143	"C" ring 1.5	2	
179	210 147	C-Washer 4	3	
180	211 614	Solder lug	1	
181	218 240	Segment, complete	1	
182	210 143	C-Washer 1.5	2	
183	219 862	Lift plate, complete with lifting bolt (up to unit no. 140 999)	1	
	220 934	Lift plate with lifting bolt, complete (units from no. 141 000 and up)	1	
184	210 475	Cylinder-head screw, AM 3 x 5	6	
185	216 853	Compression spring	1	
186	219 822	Washer 2.1/3.8/0.4 St (up to unit no. 140 999)	2	
187	216 849	Lifting bolt, complete (up to unit no. 140 999)	1	
	220 902	Lifting bolt, complete (units from no. 141 000 and up)	1	
188	216 796	Tension spring	2	
189	210 145	C-Washer 2.3	14	
190	201 187	Slip washer	1	
191	200 554	Ball bearing	1	
192	216 761	Bearing pillar	1	
193	210 609	Washer 3.2/10/1 St	1	
194	219 077	Equalizing arm, complete	1	
195	219 073	Shaft	1	
196	218 151	Locking slide, complete	1	
197	218 150	Joining nut	1	
198	209 358	Ball, 4 mm dia.	3	
199	210 586	Washer 3.2/7/0.5 St	3	
200	216 857	Bearing bracket for main lever	1	
201	216 858	Leaf spring	1	
202	219 074	Joining screw	1	
203	216 864	Shaft	1	
204	216 793	Start bracket, complete	1	
205	210 469	Cylinder-head screw, AM 3 x 3	4	
206	216 796	Tension spring	2	
207	218 241	Main lever, complete (up to unit no. 140 999)	1	
	220 933	Main lever, complete (units from no. 141 000 and up)	1	
208	216 773	Start lever, complete	1	
209	216 777	Tension spring	1	
210	218 583	Cylinder-head screw, AM 3 x 4, with ring edge	2	
211	216 844	Guide	1	
212	218 318	Positioning sleeve	1	
213	211 718	Ball, 3 mm dia.	2	
214	216 845	Rubber washer	1	
215	201 183	Tension spring for antiskating	1	
216	201 184	Adjusting washer	1	
217	216 844	Guide	1	
218	210 366	Hex nut BM 4	8	
219	218 485	Guide piece	1	
220	210 285	Oval-head sheet-metal screw, B 2.9 x 9.5	1	
	210 607	Washer 3.2/10/0.5 St	1	
221	219 079	Protecting plate	1	
222	210 469	Cylinder-head screw, AM 3 x 3	4	
223	210 145	C-Washer 2.3	14	
224	216 867	Safety washer	1	
225	216 868	Curve washer (up to unit no. 140 999)	1	
	220 909	Curve washer (units from no. 141 000 and up)	1	
226	210 361	Hex nut M 3	2	
227	216 869	Skating lever, complete	1	
228	210 362	Hex nut BM 3	5	
229	210 511	Cylinder-head screw, AM 4 x 4	1	
230	210 142	C-Washer 1.2	1	
231	218 787	Shut-off lever	1	
232	216 765	Friction plate, complete	1	
233	216 777	Tension spring for balance arm	1	
234	210 145	C-Washer 2.3	14	
235	218 154	Tension spring	1	
236	217 547	Toggle	1	
237	210 146	C-Washer 3.2	3	
238	200 453	Tension spring for positioning slide	1	

Ref.No.	Part No.	Description	Quantity	
239	218 834	Compression spring	1	
240	210 145	C-Washer 2.3	14	
241	210 145	C-Washer 2.3	14	
242	217 225	Balance plate (up to unit no. 140 999)	1	
	220 789	Balance plate (units from no. 141 000 and up)	1	
243	216 875	Bearing bracket, complete	1	
244	216 878	Lift cam, complete (up to unit no. 140 999)	1	
	220 790	Lift cam (units from no. 141 000 and up)	1	
245	217 296	Torsion spring (up to unit no. 140 999)	1	
	220 900	Torsion spring (units from no. 141 000 and up)	1	
246	210 469	Cylinder-head screw AM 3 x 3	4	
247	220 935	Adjusting screw for tonearm lowering	1	
248	210 187	Safety washer	1	
249	210 147	C-Washer 4	3	
250	210 145	C-Washer 2.3	14	
251	218 295	Cam, complete	1	
252	200 522	Snap spring	1	
253	200 650	Rubber sleeve	1	
254	214 203	Cam follower lever complete with rubber sleeve	1	
255	216 791	Pawl, complete	1	
256	219 049	Square piece	1	
257	219 083	Washer, toothed, 3.2/13/0.5 St	1	
258	219 050	Threaded bolt	1	
259	216 803	Locating slide, complete	1	
260	216 800	Positioning lever, complete	1	
261	218 583	Cylinder-head screw, AM 3 x 4, with set screw	2	
262	216 886	Bearing bracket for linking lever	1	
263	217 227	Joining screw	1	
264	216 888	Linking lever, complete (up to unit no. 140 999)	1	
	220 911	Linking lever, complete (units from no. 141 000 and up)	1	
265	210 146	C-Washer 3.2	3	
266	209 457	Inner housing for AMP-connector	1	
267	207 311	Line cord with AMP and flat-prong plugs and ground wire	1	
	213 984	Line cord with Dual and flat-prong plugs and ground wire	1	
268	209 424	Miniature 5-prong audio plug	1	
269	207 303	Plug-in audio cable with miniature plug	1	
270	209 436	Socket for flat prong	4	
271	213 980	Socket housing	1	
272	220 142	Line cord with Dual plug	1	
273	209 425	RCA-type plug (yellow) for audio cable	2	
274	209 426	RCA-type plug (red) for audio cable	2	
275	207 299	Plug-in audio cable with RCA-type plugs	1	
276	200 447	Cable clamp for audio cable	1	
277	210 472	Machine screw AM 3 x 4	3	
**	218 320	Packing carton, complete	1	
**	218 402	Stroboscope disc small, 60 Hz		
**	214 120	Cartridge mounting hard ware	1	
**	201 245	Cone-shaped piece	1	
**	217 794	Installation instructions		
**	217 795	Operating instructions in 4 languages		
**	217 807	Operating instructions (english)		
**	217 802	Operating instructions (UAP)		

** Not illustrated

Alterations reserved

Lubrication

All bearings and sliding points have been properly lubricated during assembly. Re-lubrication is normally not necessary for about two years since all important bearings are provided with oil retainers and sintered bearings.

Lubrication should be applied sparingly. It is of primary importance that no oil or grease should get onto the friction surfaces of the drive wheel, motor pulley or, turntable, to avoid slippage. For the same reason, avoid touching these parts.

Use the following lubricants:

① Wacker siliconoil AK 300 000

✓② Adhesive oil, Renotac No. 342

✓③ BP oil, Super Viskostatic 10 W/30

④ Shell Alvania No. 2

✓⑤ Isoflex PDP 40

Fig. 28 Lubrication points above chassis

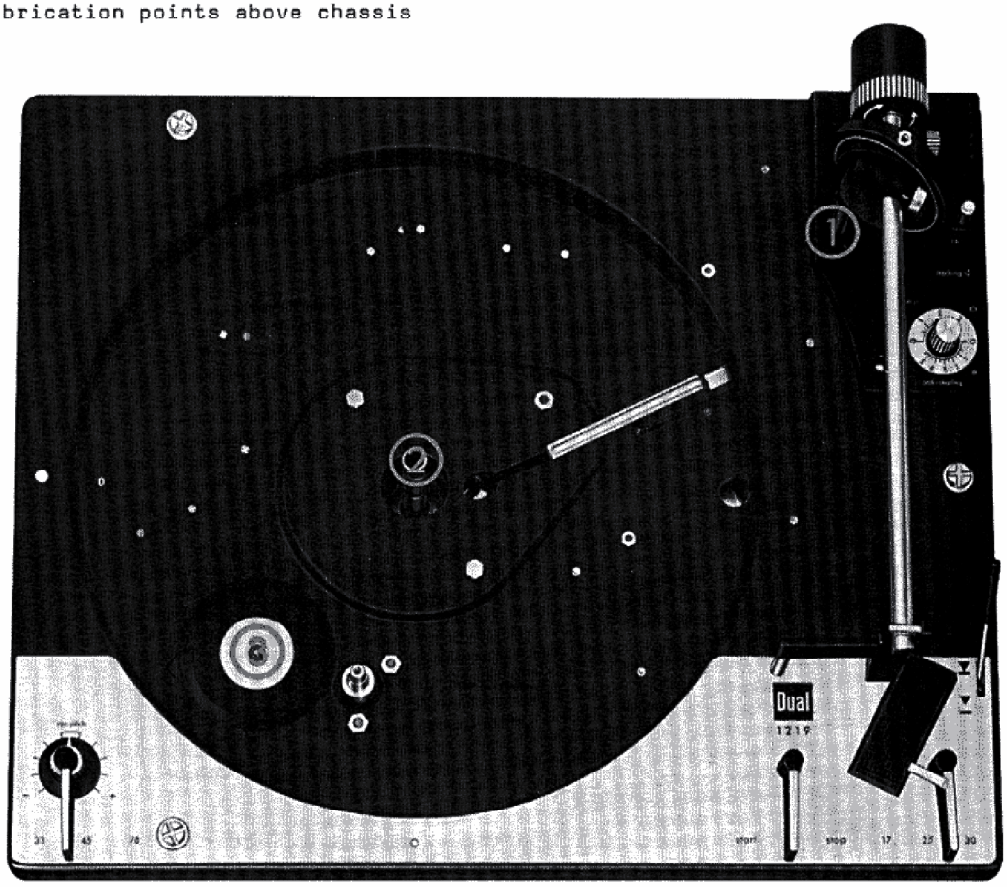


Fig. 29 Lubrication points below chassis